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Student's Numerical Ability on Minimum Competency Assessment in Indonesia: Focusing on Data and Uncertainly Problems

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ABSTRACTS

This study aims to describe students' numeracy ability in solving math problems on data content and uncertainty based on the Minimum Competency Assessment (AKM) in terms of students' initial abilities at SMPN 1 Parepare. The subjects of the study were 6 students: 2 students with low initial ability, 2 students with medium initial ability, and 2 students with high initial ability. 6 subjects are grade IX students at SMPN 1 Parepare for the 2022/2023 school year. The results showed that (1) Students with low initial mathematical ability only met three numeracy indicators. Thus, students with a low initial mathematics ability category are at the competency level of "Need for Special Intervention", (2) Students with moderate initial mathematics ability are only able to meet four numeracy indicators. Thus, students with the category of initial ability in mathematics are at the level of competence "Capable", (3) Students with early ability in high mathematics can meet all indicators of numeracy ability. Thus, students with the category of early ability of high mathematics are at the level of competence "Proficient".

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1. INTRODUCTION

Education is essential for developing competent people, and mathematics holds special importance, particularly at the elementary education level. This is because elementary education serves as the foundation for acquiring fundamental knowledge necessary for higher levels of education (Pemu, 2017). Similarly, mathematics utilizes its basic characteristics as a human activity through an engaged, evolving, and creative process, as well as organized knowledge, promoting crucial, independent, and inquisitive thinking habits that are highly valuable for students in confronting current developments in science and technology (Tahmir et al., 2018).

Students frequently find subjects, particularly mathematics, challenging due to a lack of comprehension of concepts and effective learning strategies. This includes difficulties in formulating problems, interpreting real-life situations into mathematical models, and understanding the relationships and patterns throughout mathematical structures (Syawahid, 2019).

The government has initiated the testing of the Minimum Competency Assessment (AKM) across many schools. The AKM implementation represents a specific approach to implementing the new curriculum, known as the independent learning curriculum, which was introduced by the Minister of Education and Culture, Nadim Anwar Makarim. The curriculum update provides an assessment of the execution of the prior curriculum, specifically the 2013 curriculum. Under the 2013 curriculum, graduation is dependent on the National Examination (UN), which serves as the sole determinant of student achievement in the educational journey. This is considered inappropriate because the UN focuses only on cognitive aspects and primarily engages low-level thinking skills during its implementation. The content tested in the UN is excessively complex, requiring students to fully comprehend and master all of the material (Rohim et al., 2021).

Throughout the independent learning curriculum, the United Nations (UN) is substituted by the National Assessment, which includes the aspect of AKM. The objective of AKM is to enhance learning outcomes by providing information that is directly relevant to enhancing the quality of teaching and learning. The implementation of AKM in Indonesia serves as a curriculum modification aimed at enhancing the quality of education and equipping students with 21st-century skills (Asrijianty, 2020).

In late 2018, the most recent PISA study results were published, finding that Indonesia ranks among the six lowest-performing countries out of the 79 nations that participated. Indonesia's mathematical literacy ability was measured at a score of 379, which is lower than the country's average score of 489 (OECD, 2019). This shows that the development of education in Indonesia is still far behind compared to other countries that are also participating countries in PISA.

The aim of this study is to investigate the numeracy skills of junior high school students in problem-solving tasks. The previous parts have highlighted the significance of numeracy skills for students. Numeracy serves as a metric for assessing the quality of national education. Moreover, it enables students to comprehend mathematical concepts beyond mere memorization, necessitating the utilization of advanced problem-solving abilities applicable to real-life situations. Nevertheless, the current challenge lies in the insufficient proficiency of students in comprehending mathematical principles that are relevant to real-world

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scenarios. This is evident from the PISA 2018 outcomes, which indicate that Indonesia ranks among the bottom 6 countries. The Ministry of Education and Culture has taken over from the UN and is now prioritizing Numeration in the Minimum Competency Assessment (AKM) as a means to enhance the significance of PISA and TIMSS. Ministry of Education and Culture, 2020 (cited in (Baharuddin et al., 2021).

In Research (Baharuddin et al., 2021) Stating that Students with high and medium initial ability successfully achieve all indicators of numeracy ability, whereas students with low initial ability only achieve one indicator of numeracy ability. Therefore, a higher level of initial math proficiency in students correlates with improved numeracy skills.

AKM question content consists of 4 parts, namely Numbers, Geometry and Measurement, Algebra, and Data and Uncertainty. In this study, the content to be examined is data and uncertainty. Uncertainty is a phenomenon that lies at the heart of mathematical analysis of situations. Data and uncertainty are important to analyze because they are widely implemented in everyday life, such as in making the right decisions, predicting things that will happen, minimizing losses, and others (Mutia & Effendi, 2019).

With this particular framework, this study investigates following questions:

1. How is the numeracy ability of students in solving mathematics problems on data content and uncertainty based on AKM with the category of high initial mathematics ability?
2. How is the numeracy ability of students in solving mathematics problems on data content and uncertainty based on AKM with the category of medium initial mathematics ability?
3. How is the numeracy ability of students in solving mathematics problems on data content and uncertainty based on AKM with low initial mathematics ability categories?

2. METHOD

The type of research used is descriptive qualitative. is intended to describe the ability of numeracy in solving data problems and uncertainty in the Minimum Competency Assessment (***AKM***) in terms of students' initial mathematical abilities. The research was carried out at SMPN 1 Pare-pare. The participants in this study included 6 students in grade XI.1 who were selected randomly and categorized based on their initial ability test scores. They were subsequently given a test on data and uncertainty using the AKM method as grouping by Ratumanan and Laurens (cited in (Maryam & Rosyidi, 2016).

Table 1 The Category of Early Mathematical Abiity According to Ratumanan and Laurens

Initial Capability Categories	Range of Values
High	$80 \leq$ value ≤ 100
Medium	$60 \leq$ value < 80
Low	$0 \leq$ value < 60

(Maryam & Rosyidi, 2016)

Data collection is conducted using a three-stage technique. The initial stage involves data collection through the administration of an initial ability test. This is followed by a numeracy

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ability test, and subsequently an interview conducted using test instruments and interview guidelines. All students in a class are administered an initial ability test, after which six students are chosen to undergo a numeracy ability test. Subsequently, six students were subjected to further analysis and interviews, based on the outcomes of their numeracy skills.

There are two distinct research instruments: the primary instrument and auxiliary instruments. The researcher serves as the primary tool for directly interacting with the subject and gathering the required data. Additionally, supporting instruments are used, such as initial ability tests. This assessment is utilized to ascertain the proficiency of students in basic statistical concepts and their understanding of probability in simple events.

The numeracy test questions have been modified from the minimum competency assessment questions for eighth grade. The key elements of AKM numeracy in this problem consist of data content and uncertainty, encompassing data and its representation as well as uncertainty in the occurrence of simple events. The cognitive processes involved in solving these problems require non-routine reasoning and thinking with mathematical concepts. Additionally, the personal context of the individual is closely linked to their personal self-interest. This problem assesses the minimum competencies in the data domain and uncertainty, specifically focusing on the data subdomain and its representation as well as uncertainty. Interview guidelines serve as a reference for conducting interviews with research subjects following the completion of the initial ability test and numeracy questions.

The interview guidelines possess a semi-structured format. Due to the semi-structured nature of interviews, additional questions may be included or substituted based on the findings of student work in order to gather more comprehensive information from the students. The study employs source triangulation as the data validation technique. Source triangulation is employed to ascertain the congruity between the data acquired from the initial source and that obtained from the second source. The study employs data condensation, data presentation, and conclusions as its data analysis techniques.

3. RESULTS AND DISCUSSION

Researchers analyzed data collected through the initial ability test results conducted to grade IX students to determine the research subject. The results of the initial ability test show the classification of students into three categories: high initial ability, medium initial ability, and low initial ability. Subsequently, two students were chosen, each had high, medium, and low levels of initial ability. The specific information for each chosen subject is displayed in the table below.

Table 2 Determination of the Subject of Research

No	Student Initials	Initial Capability Categorization	Student Code
1	SYR	High	S1t
2	SNQS	High	S2t
3	RS	Medium	S1s
4	MA	Medium	S2s
5	MPS	Low	S1r
6	AFS	Low	S2r

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The six selected subjects were then given numeracy questions adapted from AKM questions. After the subject completes the question, an interview is then conducted regarding the subject's answer.

Table 3 Data Recapitulation of Numeration Ability of Subjects with High, Medium, and Low Initial Ability Categories

Question Number	Indicator	S1t	S2t	S1s	S2s	S1r	S2r
1	Examine data presented in different formats by employing contextual comprehension and problem-solving techniques to reach a resolution.	√	√	√	√	√	√
	Utilize a diverse range of numbers, symbols, or mathematical instruments to depict mathematical correlations.	√	√	√	√	×	×
	Applying rigorous forms derived from mathematical definitions and concepts.	√	√	√	√	√	√
	Utilize the analysis results to forecast and make informed decisions by documenting the process of reaching a solution and summarizing the solution.	√	√	×	×	×	×
2	Examine data presented in different formats by employing contextual comprehension and problem-solving techniques to reach a resolution.	√	√	√	√	×	×
	Utilize a diverse range of numbers, symbols, or mathematical instruments to depict mathematical correlations.	√	√	√	√	×	×
	Establish connections between diverse depictions of tigers and offer explanations of the images to resolve problems in different formats.	√	√	√	√	√	√
	Applying rigorous forms derived from mathematical definitions and concepts.	√	√	√	√	×	×
	Utilize the analysis results to forecast and make informed decisions by documenting the process of reaching a solution and summarizing the solution.	√	√	×	×	×	×
3	Examine data presented in different formats by employing contextual	√	√	√	√	√	√

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	comprehension and problem-solving techniques to reach a resolution.						
	Utilize diverse visual depictions and offer explanations of images to address problems in multiple formats.	√	√	√	√	√	√
	Utilize the analysis results to forecast and make informed decisions by documenting the process of attaining solutions and drawing conclusive solutions.	√	√	×	×	×	×
4	Examine data presented in different formats by employing contextual comprehension and problem-solving techniques to reach a resolution.	√	√	√	√	√	√
	Utilize a diverse range of numbers, symbols, or mathematical instruments to depict mathematical correlations.	√	√	×	×	×	×
	Utilize the analysis findings to forecast and make informed decisions by documenting the steps taken to arrive at solutions and drawing conclusive solutions.	√	√	×	×	×	×

In numeracy questions number 1, number 2, number 3, and number 4, subjects S1r and S2r demonstrate the ability to analyse information presented in different formats by employing contextual comprehension and problem-solving strategies to solve mathematical problems. But on the other hand, research conducted by Takaria et al., (2022) Indicates that students in the study demonstrate a strong comprehension of the problem and are able to identify the given information and the question being asked. However, it is observed that while S1r and S2r subjects are capable of documenting the known information and the question, other students do not do so.

In numeracy questions 2 and 3, the subject S1r and S2r demonstrate the ability to establish connections between different types of representations and offer interpretations of images to solve problems in diverse situations. But on the other hand, research conducted by Sukmawati, (2019) shows the result that the individual has been unable to integrate various representations, including symbolization and their application to real-world scenarios. During this study, the subject demonstrated the ability to establish connections between different types of representations and offer interpretations.

In numeracy problems number 1 and number 2, subjects S1r and S2r are able to use formal forms based on definitions and mathematical rules for numeracy problems, except for number 2. In line with research conducted by Muzaki and Masjudin, (2019) shows the result that the subject is often incomplete in writing and explaining the core problem of the problem at hand.

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In numeracy problems number 1, number 2 and number4, subjects S1r and S2r have encountered difficulties in utilizing diverse numerical values, symbols, or mathematical instruments to articulate mathematical connections. In line with research conducted by Sukmawati, (2019) indicates that the subject has not demonstrated the ability to effectively apply their comprehensive understanding, coupled with technical proficiency in mathematical operations, to develop strategies and employ innovative approaches when faced with new challenges.

In numeracy questions number 1, number 2, number 3, and number 4, subjects S1r and S2r have demonstrated a lack of ability to interpret the results of the analysis and use them to predict outcomes and make informed decisions. They have also failed to document the process they used to arrive at solutions and draw conclusions. In line with research conducted by Baharuddin et al., (2022) shows the result that the subject is unable to provide conclusions towards solving the problem on the problem.

In numeracy questions number 1, number 2, number 3, and number 4, S1 and S2 subjects demonstrate the ability to analyse information presented in different formats by employing contextual comprehension and problem-solving strategies to solve mathematical problems. In line with research conducted by Muzaki and Masjudin, (2019) and Sanvi and Diana, (2022) shows the result that the subject is capable of articulating both the existing knowledge and the specific inquiry of the question with clarity, precision, and comprehensiveness.

In numeracy problems number 2 and number 3, subjects S1s and S2s demonstrate the ability to establish connections between different types of representations and offer interpretations of images to solve problems in diverse contexts. In line with research conducted by Sukmawati, (2019) shows the result that the subject possesses the capacity to choose and merge various forms of representation, including the ability to symbolize them and establish connections with real situations.

In numeracy questions number 1 and number 2, subjects S1s and S2s are able to use formal forms based on definitions and mathematical rules. In line with research conducted by Muzaki and Masjudin, (2019) indicates the result that the subject possesses the ability to comprehend the problem and resolve it using mathematical formulas, while also executing the procedure proficiently.

In numeracy problems number 1, number 2, and number 4, subjects S1s and S2s can utilize different numerical representations, symbols, and mathematical instruments to describe mathematical relationships in numeracy problems, with the exception of question number 4. In line with research conducted by Baharuddin et al., (2022) shows the result that the subject is able to establish the solution of a problem so as to get the right answer result.

In numeracy questions number 1, number 2, number 3, and number 4, The S1 and S2 subjects have demonstrated a lack of ability to interpret the results of the analysis and use them to make predictions and decisions. They have also failed to document the process of reaching solutions and drawing conclusions. In line with research conducted by Baharuddin et al., (2022) shows the result that the subject has not been able to draw conclusions from the problem at hand.

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In numeracy questions number 1, number 2, number 3, and number 4, S1t and S2t subjects demonstrate the ability to analyse information presented in different formats by employing contextual comprehension and problem-solving strategies to solve mathematical problems. In line with, research conducted by Muzaki and Masjudin, (2019) and Takaria et al., (2022) shows the result that the subject demonstrates a strong comprehension of the problem and is able to accurately identify the information that is known and the information that needs to be obtained.

In numeracy problems number 1, number 2 and number 4, subjects S1t and S2t can employ a range of numbers, symbols, and mathematical tools to represent mathematical relationships. In line with research conducted by Baharuddin et al., (2022) shows the result that the subject is able to make a solution plan correctly, the subject demonstrates proficiency in formulating accurate solution plans, proposing formulas, and effectively solving problems.

In numeracy questions number 2 and number 3, subjects S1t and S2t demonstrate the ability to establish connections between different representations and utilize visual interpretations to solve problems in diverse contexts. In line with research conducted by Sukmawati, (2019) and Muzaki and Masjudin, (2019) show the subject should possess the capability to efficiently perform tasks and comprehend various forms of data, subsequently establishing connections to real-life scenarios.

In numeracy problems number 1 and number 2, subjects S1t and S2t can utilize formal forms, which are derived from definitions and mathematical rules. In line with research conducted by Muzaki and Masjudin, (2019) shows the results that the subject demonstrates proficiency in solving routine problems, interpreting and solving problems using formulas, executing procedures effectively, adapting to complex situations, and employing logical reasoning to solve problems.

In numeracy questions number 1, number 2, number 3, and number 4, the subjects S1t and S2t can analyse the results and use them to make predictions and decisions. They demonstrate this by documenting the process they used to arrive at the solutions and by drawing conclusions based on those solutions. In line with research conducted by Baharuddin et al., (2022) shows the result that the subject is able to provide a conclusion to the problem solving in the problem.

4. CONCLUSION

Grade IX students with high initial mathematics skills only meet five numeracy indicators. Thus, students with high initial mathematical ability categories are at the level of "Proficient" competence. However, students possess the ability to employ logical thinking in order to resolve intricate and unconventional problems, drawing upon their understanding of mathematical principles.

Grade IX students with moderate initial mathematics skills were only able to meet four numeracy indicators. Thus, students with the initial ability category of mathematics are at the level of " Capable " competence. However, students possess the capability to utilize their mathematical expertise in a wider range of situations.

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Grade IX students with high initial mathematics ability can meet 3 indicators of numeracy ability. Thus, students with low initial mathematical ability categories are at the "Need Special Intervention" level of competence. However, students possess a restricted amount of knowledge and are capable of demonstrating only a partial level of mastery in concepts and limited computational abilities.

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